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FARM WORKSHOPS

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INTRODUCTION

Modern farm machinery requires both careful maintenance and precise repair work. Well-serviced equipment will increase the efficiency of field operations and reduce down-time, lower repair costs, increase the machine's useful life and increase the trade-in value.

An important part of any modern farm is a properly designed and equipped workshop where the repair and maintenance of machinery can be conducted. Repair and maintenance work on farm machinery are often postponed until they cannot be avoided. Most often the cause is a lack of a suitable service area with the necessary equipment. The time saved and frustration avoided in having tools, repair parts and supplies stored together are reasons enough to seriously consider some type of centralized shop facility.

Having a warm shop in which to work allows extensive repairs or overhauls to be conducted during winter when more time is available. When not occupied by large machinery, the workshop can double as a heated storage for a truck or tractor which must be started frequently during winter.

SELECTING A SITE

Site selection is often the most difficult task in planning a workshop. The workshop should be situated about 100-200 feet (30-60 m) from one's house and at least 150 feet (45 m) from other buildings to allow for future expansion, reduce fire hazard and allow room for manoeuvring and parking machinery. The site should be well-drained and be accessible to service drives and electrical and water lines.

Orient the workshop so that main doors are away from prevailing winter winds. Orienting the roofline with prevailing winds will help keep snow off the roof. Where possible, locate large doors in end walls to eliminate sliding snow and roof water from falling in this area. Remember that any new structure may alter the snowdrift pattern around adjacent buildings.

The floor of the workshop should be elevated at least 4-12 inches (100-300 mm) above the natural outside grade to provide good drainage, and to ensure that access doors remain free from ice and snow.

FLOOR PLAN

Some farmers may wish to add a workshop area to their machinery storage building; others may wish to construct a separate building for a workshop. Although the fire potential of the machinery storage area will be higher with the attached workshop, shop location is more convenient when both areas are combined in one building. Check with the Municipality regarding fire separation requirements under the Canadian Farm Building Code 1990. Regardless of the choice, the workshop area should be sized in relation to the capacity of the machinery storage area. Generally, the workshop area should be at least 20% as large as the area used for machinery, but not less than 400 ft^2 (37 m^2) in area.

It is important that the workshop be able to accommodate large machines. The size of the shop will depend on farm size, equipment to be repaired and tools used.

In sizing a workshop, consider the space occupied by the largest machine on the farm, plus additional service space around the machine, plus a workbench and equipment area along the walls. The service area should be 4-5 ft. (1.2-1.5 m) wide around the perimeter of the machine, and the workbench and equipment area should be 3- 4 ft. (1-1.2 m) wide along the walls.

Easy movement of machines into and out of the workshop should be considered. Location of doors will depend upon the choice of floor plan and on the type of construction. The farm workshop should accommodate any machine which is being stored; consequently, height and width of access doors are important considerations. A door equivalent in size to the largest one in the machinery storage area should be provided in the shop.

Generally, machinery access doors should be 24 inches (600 mm) wider and 6 inches (150 mm) higher than the largest machine stored. Therefore, machines such as self-propelled combines and self-unloading wagons may require an access door up to 14 feet (4.25 m) high and 16-20 feet (5-6 m) wide.

Where practical, large access doors should be located on the end walls, and be 2 ft. (600 mm) wider than the width of the machine bay area (Figure 1). One machinery access

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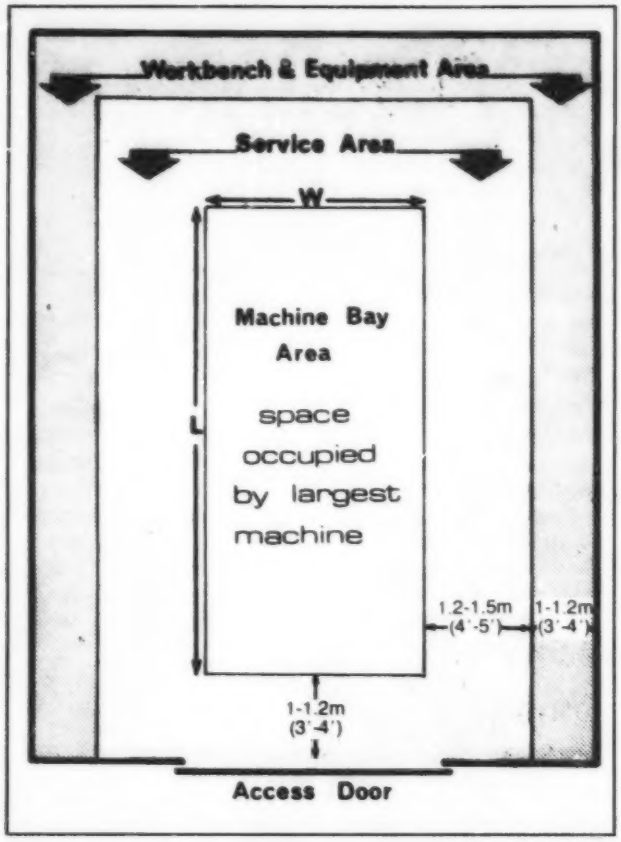

Figure 1. Suggested minimum dimensions for farm workshops.

door to the workshop may be adequate; however, a door in both the front and back of the shop will offer "drive-through" ease in handling large machines. Overhead doors are preferred in the workshop as they are easier to open, especially during winter conditions, and are more efficient in retaining heat in the workshop as compared to sliding doors. Overhead doors, however, are more costly.

In addition to the machinery access doors, one man-door should be provided near the main machinery access door.

CONSTRUCTION

With the exception of insulation requirements for the workshop, suggested construction techniques for farm workshops are identical to those recommended for farm machinery storages. (See OMAF Factsheet, *Farm Machinery Storages*, Agdex 733.)

The walls, ceiling, and machinery access doors of the workshop should be insulated to a minimum of R20 (RSI 3.5) with a vapour barrier installed on the interior side of the wall to prevent moisture migration into the insulation. Overhead insulated doors provide the tightest seal for the heated workshop. Galvanized steel provides a bright and durable interior wall finish with some fire-resistant qualities. Before construction begins, check with your insurance company regarding minimum requirements that they may have for interior linings in a workshop so that you are sure that the shop will be eligible for coverage when completed. Prepainted steel for exterior siding will last 15-20 years without refinishing, and can enhance the appearance and value of the farm. White coloured, steel-clad buildings will be much cooler than dark coloured ones in the summer.

A concrete floor in the workshop area will promote cleanliness and comfort. The floor should be sloped at a grade of 1 inch per 8 feet (1 mm per 100 mm) to a floor drain (with sediment bucket) to remove snow melt and wash water.

It is impractical to install enough windows to provide sufficient light for working. They should only be sized for convenient viewing of the house or yard. They may also be used for ventilation during hot weather.

SERVICES

Electrical

The electrical service entrance should have some reserve capacity for future expansion. Generally, the minimum should be 100 amperes, 120/240 volts. A 240 volt outlet should be provided close to the main entrance to accommodate an electric arc welder and other heavy equipment. All convenience outlets (120 volts) should be of the 3-wire grounded type and should be spaced every 10 ft. (3 m) around the shop walls. Space convenience outlets along the workbench 4 ft. (1.2 m) apart. A weatherproof 120 volt outlet outside the shop door is useful for an engine block heater, high pressure washers, and trouble lamps. Make sure that all wiring meets the standards of the Electrical Safety Code for Ontario (20th Edition). Consult your Ontario Hydro representative in this regard.

Lighting

Irrespective of windows in a farm workshop, the primary source of light should be artificial. It is recommended that a minimum of one 40-watt fluorescent tube for each 35 square feet (3 m^2) or one 100-watt incandescent bulb for each 100 square feet (10 m^2) be provided. For workbenches where lamps are suspended 4 ft. (1.2 m) overhead, use either a 4 ft. (1.2 m) fluorescent fixture with 40 watt tubes, or two 150 watt reflector lamps spaced 4 ft. (1.2 m) apart. This light layout helps to eliminate shadowing.

Heating

Even if the shop is well insulated, some supplemental heating will be required to provide comfortable working conditions. Supplemental heat can be provided by a furnace or stove, a suspended gas-fired or electric unit heater, or by radiant heaters. Floor heat can be provided by floor heating cables, thus providing more comfort while working beneath machines. Regardless of the type of heating, the shop will generally be heated only when you are working in it. Therefore, the heater should have enough capacity to raise the temperature to a comfortable level in a relatively short period.

To help save on heating bills, it is possible to supplement the shop heat using solar energy. For further information on this topic, see OMAF Factsheet, *Passive Solar Shop Heating*, Agdex 708.

Ventilation

Exhaust fans with a minimum capacity of 1 cubic foot of air per minute per square foot (5 ℓ/s per square meter) of floor area should be installed in the workshop to remove

gases and fumes during the colder weather. For hot weather and rapid air removal, the exhaust fan(s) should have sufficient capacity to provide a complete room air change every 2-3 minutes. A two speed or variable speed fan can help facilitate both of the above ventilation rates. These fans should be located in the paint and welding areas, and should always exhaust air to the outdoors. If a grease and repair pit is installed below floor level, separate mechanical exhaust ventilation with a capacity of 2 cubic feet of air per minute per square foot (10 ℓ/s per square meter) of pit floor area should be provided at the pit floor. Some provision should be made for allowing the entrance of fresh air into the shop when exhaust fans are operating (e.g., open windows).

Exhaust fans, however, are **not** intended to provide sufficient ventilation so that internal combustion engines can be operated in the workshop without special precautions. Always connect a flexible hose to the exhaust pipe of the engine being operated and pass it directly outside through a hose port in the door, or a permanently installed wall port. Locate this wall port well away from any doors or windows to prevent re-entry of the exhaust fumes.

The attic air space should be naturally ventilated to prevent moisture accumulation. Provide a minimum of 1 square foot of eave inlet opening into the attic per 300 square feet of ceiling area (1 square meter per 300 square meters of ceiling area). A similar amount of exhaust area should be provided via ridge ventilation.

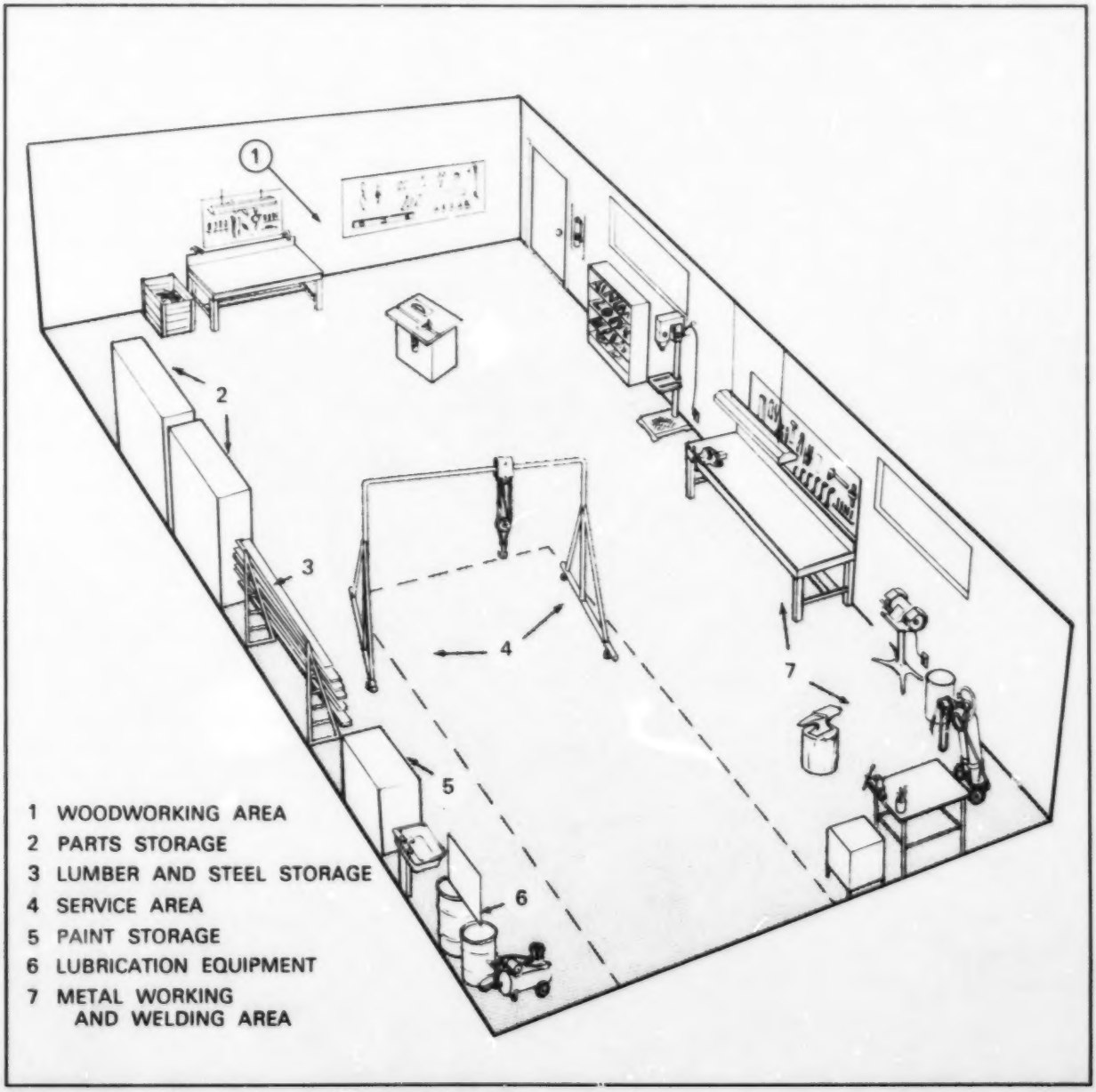

Figure 2. A typical basic floor layout for a farm workshop.
(Drawing courtesy of Agriculture Canada Publication 1588, Farm Workshops.)

EQUIPMENT LAYOUT

A farm workshop should provide plenty of room for storage of equipment, tools, parts, nuts and bolts, etc., and some space for new tools and equipment.

The interior layout should be planned to provide maximum convenience for doing repair work. Welding units (gas and electric) should be located immediately inside the large door so that they are accessible for use inside or outside the building. Adjacent to the opposite edge of the door, space should be provided for a portable air compressor which can be used either inside or outside the shop.

A large open area where machines can be serviced and repaired should extend inward from the large access door. Workbenches, tools, and equipment storage cabinets should be placed against the walls (Figure 1). A drill press or a grinder should be located so that long pieces of stock can be accommodated with ease. It is recommended that a desk and storage cabinet be included in a convenient location. This will provide a place for service record keeping and storage of operator's manuals. Figure 2 shows a typical floor layout for a farm workshop.

HOISTS

Never support a hoist on the roof trusses since this will place an unsafe concentrated load on that portion of the building. It is recommended that a portable beam supported at both ends with A-frames on casters be used to support a chain hoist. An alternate method of carrying a chain hoist is to utilize a steel beam across the width of the workshop; such a beam must be separately supported at each wall as a permanent part of the building. However, a permanent steel beam support does not have the versatility of a mobile A-frame unit.

FIRE PREVENTION

According to the Canadian Farm Building Code 1990, farm machinery repair rooms must be separated from other occupancies by fire separations having a fire-resistance rating of not less than 30 minutes. An example of a 30-minute fire-resistance rated wall would include 2" x 4" (38 mm x 89 mm) studs on 16 inch (400 mm) centres with 1/2 inch (11.0 mm) douglas fir plywood or waferboard on both faces. Before constructing a workshop, contact your municipality to obtain further details on the requirements for fire-resistance rated walls.

A fire extinguisher of the dry chemical or carbon dioxide type should be provided immediately inside each of the main doors so that they can be reached without entering the building. These types of extinguishers are recommended for oil and electrical fires and may also be used for small trash fires. Combustible or corrosive materials are better not stored in the shop at all. However, if they must, be sure to store them a safe distance away from any heating equipment.

As a fire prevention measure in a metal working or welding area, it is recommended that 4 feet (1.2 m) of sheet metal or asbestos board sheathing be placed on the bottom of the wall around the equipment.

SAFETY TIPS

Always wear goggles when chipping, grinding, or working in a position beneath equipment where debris can fall in the eyes. When welding, use a suitable shield, helmet, or goggles.

Before going beneath it, always block up a machine that is supported by a hoist or jacks. Keep the floor free from grease, oil spills, and debris. Never clean parts with gasoline or other flammable solvents, and never store gasoline in the workshop.

FARM BUILDING PERMITS

All farm buildings, including farm workshops, must comply with the Canadian Farm Building Code 1990. Farmers must contact their local municipality to make application for a building permit before construction begins and obtain other information relating to their proposed building project.

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